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Computer Operation Series

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Computer Operation Series

GS-0322

CONTENTS

SERIES DEFINITION

This series includes positions the paramount duties of which involve operating or supervising the operation of the controls of the digital computer system. Also included are positions involving the operation of peripheral equipment when: (a) such equipment is used directly in support of computer operations; and (b) the operation of such equipment is directly related to acquiring the knowledges and skills needed in operating the control console of a computer system. Positions in this series require a knowledge of the functions of the various computer features and the skill to read, interpret, and correctly respond to information in the form in which it is transmitted through the computer system.

This standard cancels and supersedes the standard for the Computer Operation Series which was issued in December 1968.

EXCLUSIONS

1. Positions involving responsibility (a) for major program modifications or substantive and extensive changes in the design of the logical steps in the programs being processed; or (b) for the initial design and development of new programs and applications in combination with responsibility for the operation of computer consoles. Such positions are classified in the Computer Specialist Series, GS-0334.

2. Positions involving primarily clerical or technical support work (e.g., tape library, production control, schedule development, limited phases of computer specialist functions) to insure the smooth operation of systems for producing work by use of digital computers. Such positions are classified in the Computer Clerk and Assistant Series, GS-0335.

3. Positions which involve operating digital and/or analog computers as a tool in accomplishing scientific, technical, or mathematical work when a knowledge of the subject matter is paramount. Such positions are classified in the series appropriate to the subject matter skill required.

4. Positions involving the operation of electric accounting machines and special purpose devices which are not used directly in the support of computer operations. These positions are classified in the Electric Accounting Machine Operation Series, GS-0359.

5. Positions involving the operation of card punch machines, verifiers, or other key driven devices such as data converters. Some of these positions may involve, on a continuing basis, punching cards or preparing tapes in formats acceptable to computers. Such positions are classified in the Data Transcribing Series, GS-0356.

6. Positions involving the operation of remote access computer terminals (entering or retrieving stored subject-matter data, entering parameters for production jobs, performing text storage and editing and others). Such positions are classified to an appropriate clerical, technical support, or subject-matter specialist series.

7. Positions involving full-time operation of peripheral computer equipment (card readers/punches, optical character readers, tape and disk drives, high speed printers, etc.) or other related equipment in support of computer production services, except when such operations are part of a prescribed development plan to learn to control the computer through a central console. Such positions are classified in the Equipment Operator Series, GS-0350.

8. Positions involving the operation of computer terminals as part of communications control systems when the paramount requirements for such positions are knowledge of communications procedures, methods, and techniques and the circuits, channels, and other specific aspects of communications systems used in transmitting and receiving messages. Such positions are classified in the General Communications Series, GS-0392.

NATURE OF THE EQUIPMENT USED

Computer Systems

As used in this standard, computer systems include the basic computers themselves and the memory, peripheral, and other equipment interconnected with them. For a general discussion of computers, and their characteristics and capabilities, see "Background Information Regarding Computer Occupations," filed under Code GS-0332/0335. Despite many differences in design, size, purpose, and operating features, computers have certain common characteristics. Each computer has a minimum of basic components:

 -- Input devices such as card readers, magnetic tape units, console typewriters, or interconnected terminal stations which are used to enter data and/or commands into the system.

 -- Central processing unit(s) which contains the circuitry for performing operations on data, making logical decisions, interpreting and controlling instructions, and directing the other elements of the system through internally stored instructions (operating systems).

 -- Output devices such as printers, card punches, magnetic tapes, or terminal stations which are used to convert or display processed data in a form that allows immediate examination of the results or in a form that stores such data for further processing.

In addition to the basic components common to all computer systems, a number of tape, disk, and/or drum storage devices are connected as part of the total equipment configuration. Such storage devices add to the amount and variety of processing capacity available in the systems. Many computer

systems are connected with other locations outside the computer center through accessory computer, communications, controller, and related devices (teleprocessing) in order to provide access to programs from "remote stations" through keyboard and printer or video screen devices. These connections to locations outside the computer center extend direct access to programs and data manipulation to a wide variety of subject-matter users of computer systems and processed information.

Computer systems are typically controlled through the use of at least one console station (keyboard and printer or keyboard and video device) used in monitoring the flow of information into and out of the system. Through the control console, operators can also monitor the flow of information and instructions among the various components and the status of jobs that are being processed, awaiting in queues for processing, and awaiting completion of output operations. Some very large multiprocessor systems are subdivided in control functions such that two operators control specifically defined aspects of the total operations through separate consoles. In addition, many systems have attached a control console that is used primarily by manufacturer's representatives for test and maintenance processes, although such consoles can be used to operate the systems in the event of problems with the normal control consoles.

In many Federal computer centers, a variety of manufacturers and vendors supply the equipment that is joined together to comprise a computer system. Even with a single kind of equipment, such as tape drives, several vendors may be represented within a single computer room. Similarly, the various components that comprise teleprocessing systems and connect them with central computers may be provided by a number of different vendors or service contractors. Consequently, the operator, in identifying equipment problems, often has to identify the specific device that is malfunctioning in order to request assistance from the appropriate vendor's repair representative.

Peripheral Equipment

In this standard the term "peripheral equipment" is used to denote equipment that is uniquely and specifically designed for computer purposes. Standard peripheral equipment includes card readers and punches, line and page printers, tape reel units or drives, photostatic copy processors, and others. Such equipment produces data on magnetic tapes, disks, punched cards, or paper copy which are used in processing or are the products provided to data processing customers. Most equipment of this kind can be interconnected with computer consoles and operated online, or it can be operated independently or offline.

A range of other special purpose devices can be operated either online or offline such as plotters, data display terminals, computer output microfilm units, optical character readers, and similar devices that use paper, tape, or disk sources for information to be converted to another kind of product. Typically, such equipment is operated offline using a computer-produced tape or disk for source information to be translated to drawings, microfilm images, and other products. A growing number of such devices incorporate features associated with computer systems (and in fact are small dedicated, single purpose, computer systems) including a control console, associated memory units,

and a small central processor that make the equipment more efficient and flexible in performing highly specialized processes and transferring data for specific kinds of products.

NATURE OF THE WORK

Just as there is no standard computer system, there is no single pattern of duties and responsibilities for operating computer systems. Operating a computer essentially entails: readying the equipment for operation; setting dials, switches, and other controls; entering commands to activate a variety of equipment and internal program resources; monitoring and controlling operations during processing; and responding to programmed instructions and unscheduled program halts caused by machine failures, program bugs, or invalid data. Even those duties and responsibilities vary significantly among computer centers according to differences in equipment configurations, the amount and kind of internally stored control and utility programs, and specific responsibilities or restrictions for operators to identify and resolve specific kinds of operating problems.

Computers vary widely in the number and kinds of jobs that are processed in them and the amount of control that can be exercised by operators. Some systems perform only one processing job at a time although, by changing a tape, disk, or diskette and/or adding a few commands, such systems may run a variety of jobs, one at a time. Large, general purpose computer systems can accept and process many jobs at the same time (multiprogramming). The jobs may be a mixture of those entered by the operator and others that are entered by users through remote terminal stations. Such mixtures may involve literally hundreds of jobs in the system at any given moment. Other differences in computer systems result from differences in the amount and kind of, and the ability to control, internally programmed software routines and subroutines which regulate operating systems (internal supervisory or executive programs), compilers, assemblers, and others. Such programs control internal processing steps and job flow or they are designed to test and accept new applications or systems programs. Permanently stored operating systems include routines that will:

    -- compile, assemble, and edit (limited debugging) test programs;

    -- provide libraries of standard, frequently used production programs;

    -- locate and specify input/output channels and devices for each job;

    -- control multiprogramming job separation;

    -- receive, respond to, and transmit system and program error messages;

    -- provide error listings and identify internal checkpoints;

    -- automatically spool intermediate and finishing products for use in other jobs and processes;

-- build input and output queues and automatically release jobs from queues; and

-- perform other process control functions that were once the operator's responsibility.

Other variations in computer systems involve such things as the amount, kind, and uses of peripheral devices; presence or absence of teleprocessing channels; and other equipment or system differences that are designed to meet the needs of a particular organization. Variables in system design introduce related variables in operator jobs. Even in two organizations using the same make and model of equipment, operator jobs will not be identical. Operators need to know what is built into the systems and the controls they have over the equipment, jobs, and software routines.

In some assignments, a single operator is responsible for all of the tasks required to set up and operate the computer and its associated peripherals and to resolve the majority of problems that may occur during operations. In other assignments, operators work in teams in which some employees work on the peripheral devices, at least one controls the system through a central console, and, often, one employee is responsible primarily or entirely for resolving operating problems. In team situations, the employees will often rotate in the different work stations as a part of training, to provide relief for others, to cover for periods of leave, or other reasons. In some organizations, the console operator is responsible for resolving the full range of problems that occur. In others, the console operator is responsible only for those problem conditions that can be resolved through the console or by directing others to make specific kinds of equipment adjustments. Some operators are assigned primary responsibility for resolving those problem conditions that do not respond to standardized commands from the control console. Such an operator isolates the causes of problem conditions, resolves many of them, and for very serious systems problems, seeks assistance from appropriate specialists. Problems can range from resetting switches and making minor mechanical adjustments on tape drives to those that require diagnoses in order to isolate and correct teleprocessing circuit difficulties, data gaps or erasures in disks, disk head crashes, and many other problems that may be complex and difficult to identify and resolve.

Computer operators must have ability to isolate and resolve problems encountered during processing since errors that result in the loss of information, erroneous work products, or damage to the programs are costly. Restructuring lost data and rerunning programs involve the expenditure of substantial resources in terms of machine time and the time and efforts required by others such as programmers, system analysts, and subject-matter specialists. An operator's knowledge of the system and the ability to utilize such knowledges to keep the system running, recover from full or partial failures, or save jobs in progress without resorting to full restart and/or data restoration procedures can often spell the difference between timely accomplishment of work and costly delays. The operator's alertness, speed, and accuracy of judgment in determining what should or should not be done are crucial requirements when problems arise.

As with operating and solving problems in the computer systems, there is wide variation in the degrees to which operators are involved in testing new or modified programs. In some systems, testing is totally controlled by specialists from the control console or through remote job entry

terminals and there is virtually no active operator participation. In others, operators are deeply involved in setting up at least part of the job control stream, selecting and activating a sequence of utility routines (compile, assemble, edit, debug, etc.) and reviewing test results to identify more efficient ways to use available equipment and utility programs and resolve equipment utilization problems.

Within such a variety of work situations, there are a number of differences in duty assignments which have a significant influence upon the grade level of a particular position. Program subject matter, program logic, or data contents do not directly affect operator responsibilities or position grade levels. Rather, position grades are influenced by the complexity and diversity of the equipment systems and the extent to which the operator actually participates in controlling, adjusting, and modifying them. The criteria in this standard are designed to treat operator positions in terms of those operator/system/ problem solving relationships. The criteria provide that, depending on the degrees of involvement and complexity, computer operators may be graded at full performance levels in grades GS-3/9. Full performance levels at grades GS-3/5 generally indicate that, due to the nature of the equipment and programs operated, there is little or no opportunity to become involved in the more complex aspects of computer operations. Higher levels represent progressively greater scope and depth of such involvement. The criteria can be applied also to describe training levels and employee development in learning about, and ultimately taking responsibility for, progressively more involved phases of computer operations, control, and problem resolution assignments.

GLOSSARY OF TERMS

Some terms and abbreviations common to this occupation are provided below. They are framed primarily to assist personnel specialists in using this standard. Some of the terms and definitions are peculiar (()) to the needs of this standard. However, as much as possible, they have been aligned with the more comprehensive definitions appearing in the Federal Information Processing Standards Publication 11-1 (American National Dictionary for Information Processing; X3-TR-1-77, Computer and Business Equipment Manufacturer's Association, Washington, D.C., September 1977).

APPLICATION: The subject-matter process or problem to which the computer technology is applied; e.g., payroll system, supply system, control of incoming aircraft.

BATCH: An approach in which the items to be processed are collected into groups prior to processing.

CENTRAL PROCESSING UNIT (CPU): A unit of a computer that includes circuits controlling the interpretation and execution of instructions. Synonymous with central processor, main frame.

COMPILER: A computer program that translates programs written in higher level languages (e.g., COBOL, FORTRAN) into assembly language and/or machine language. In addition to the translating function, it is able to replace certain items with series of instructions, usually called subroutines.

CONFIGURATION: The "ready to operate" interconnection of the Central Processing Unit (CPU) with input, output, memory, telecommunication, and other devices, systems, channels, or circuits to perform processing.

CONTENTION: Program or data requirements needed by two or more programs within the same scheduling period, requiring adjustment of processing sequence.

CONVERSATIONAL MODE: A mode of operation of a data processing system in which a sequence of alternating entries and responses between a user and the system takes place in a manner similar to a dialog between two persons.

DATA LINK: The physical means of connecting one location to another for the purpose of transmitting and receiving data.

DEBUG: To detect, trace, and eliminate mistakes in computer programs.

DEDICATED: Assigned to a single purpose for processing one kind of information, or processing data only for a single set of narrowly defined subject-matter applications.

DEGRADED: (Also degraded system, system degradation) Partial failure in system operating capabilities during which some work may continue. As opposed to system failure in which ability to continue operations is temporarily lost.

DEPENDENCY: Processing in which output from one program or job becomes input for another program or job.

DISTRIBUTED PROCESSING: A method to provide direct computer access to users located outside the data processing center, normally through a remote terminal communications network.

DUMP: A listing of the contents of the core, a disk, or other storage device.

FAILURE: (Also, abnormal termination, unscheduled halt) Unanticipated termination of processing due to a fault or error.

GENERAL PURPOSE COMPUTER: A computer designed to solve a large variety of problems and hence can be used for a very large class of applications.

HARDWARE: The physical equipment or devices forming the central processing unit and its peripheral equipment.

IMPLEMENTATION: Descriptive of the tasks required to translate plans into usable form.

INPUT: (1) The data to be transferred from an external medium (e. g., disk, tape) to the internal storage of the computer; (2) a device for this transfer of data.

INPUT-OUTPUT (or I/O): (1) The equipment used to communicate with a computer; (2) the data involved in the communication.

INTERACTIVE MODE: Synonymous with conversational mode.

JOB: A list of data that completely defines a unit of work for a computer. A job usually includes all necessary computer programs, linkages, files, and instructions to the operating system.

JOB CONTROL LANGUAGE (JCL): A language designed to express statements in a job that are used to identify the job or describe its requirements to operating systems.

MICROCOMPUTER: A small version of the control system of a standard computer; usually used as part of other automatic devices.

MICROPROCESSOR: A small chip of silicon that provides a microcomputer with its capability.

MINICOMPUTER: A relatively small, inexpensive computer; usually with limited data storage capacity.

MODE: A particular method of computer processing, such as batch processing or real time processing.

MODEM: (Modulator-demodulator) A device that modulates and demodulates signals transmitted over data communications facilities.

MODIFICATION: Changes made in redesigning a portion of a system to produce results or products in addition to or different from those originally intended.

MULTIPROCESSOR: A computer employing two or more central processing units under integrated control.

MULTIPROGRAMMING: A mode of operation that provides for the interleaved execution of two or more computer programs by a single central processing unit.

OFFLINE: Descriptive of processing operations where the peripheral equipment used is not under control of the central processing unit.

ONLINE: Descriptive of processing operations where the peripheral equipment is under control of the central processing unit. The term "online" is also used to describe a user's access to a computer via a terminal.

OPERATING SYSTEM: The system software controlling program execution and performing debugging, input-output control, and similar tasks.

OUTPUT: (1) The data to be transferred from internal storage of the computer to an external medium (e.g., disk, tape, paper); (2) a device necessary for this transfer of data; (3) paper copy, microfiche, etc., produced from the data.

PERSONAL COMPUTER: A computer acquired and developed by individuals for their own personal use.

PROGRAM: (1) The collection of instructions that serve to cause the computer to use and manipulate data to solve a problem; (2) to design, write, and test computer programs.

REAL TIME: Pertaining to a performance of a computation during the actual time that the related physical process transpires, in order that the results of the computation can be used in guiding the physical process. Occasionally used (loosely) to describe systems operating in conversational mode.

REMOTE JOB ENTRY (RJE): Submission of jobs through an input unit that has access to a computer through a data link.

REMOTE STATION: Data terminal equipment for communicating with a data processing system through a data link.

ROUTINE: An ordered set of instructions that may have some general or frequent use.

SETUP: An arrangement of data or devices to solve a particular problem.

SOFTWARE: Computer programs, procedures, rules, and possibly associated documentation concerned with the operation of a data processing system.

SYSTEM: 1. The total collection of interconnected and interrelated equipment and its processing capabilities available to perform data processing functions. 2. A collection of interrelated computer processing programs, typically using a common data base or interconnected data bases to produce output for a functional program such as personnel, supply, finance, and others.

TELECOMMUNICATIONS: Descriptive of systems involving transmittal of data via communications lines, radio, television, light beams, etc.

TELEPROCESSING: The application of telecommunications systems for directly controlling specific processing actions from a remote terminal station (i.e., input and retrieval operations, remote job entry, program testing, and debugging, etc.).

USER: The organization concerned with the subject matter of the computer application (e.g., in the case of an automated payroll system, the finance organization is the user).

UTILITY PROGRAM: A computer program is general support of the processes of a computer (e.g., a diagnostic program, trace program, sort program).

UTILITY ROUTINE: A routine in general support of the processes of a computer (e.g., input routine).

TITLES

The title *Computer Operator* is established for nonsupervisory positions.

Positions which meet the criteria of the Work Leader Grade-Evaluation Guide for evaluation as leaders should be titled *Lead Computer Operator*.

Positions which meet the criteria of the General Schedule Supervisory Guide for evaluation as supervisors should be titled *Supervisory Computer Operator*.

EVALUATION OF POSITIONS

1. Supervisory positions are evaluated according to the classification criteria contained in the General Schedule Supervisory Guide.

2. Work leader positions are evaluated by means of the classification criteria contained in the Work Leader Grade-Evaluation Guide.

3. Nonsupervisory positions engaged in the operation of computers are evaluated by the criteria contained in this standard.

   - Positions should be evaluated on a factor-by-factor basis using factor level descriptions contained in this standard. Benchmarks are included (one per grade level for grades GS-3/9) to illustrate how the factor levels may be interpreted and should, to the extent possible, be used in evaluating positions.

   - The primary standard may be used to evaluate factors of positions that significantly exceed the factor level descriptions contained in this standard. (See "Instructions for the Factor Evaluation System," TS 27, dated May 1977.)

4. The great majority of positions to which this standard applies are in this series. However, the standard also is applicable to computer operator duties included in other positions, even though these duties may not be controlling for series determination purposes.

GRADE CONVERSION TABLE

GRADE	POINT RANGE
1	100 - 250
2	255 - 450
3	455 - 650
4	655 - 850
5	855 - 1100
6	1105 - 1350
7	1355 - 1600
8	1605 - 1850
9	1855 - 2100
10	2105 - 2350

FACTOR LEVEL DESCRIPTIONS

FACTOR 1, KNOWLEDGE REQUIRED BY THE POSITION

Factor 1 measures the nature and extent of information or facts which the workers must understand to do acceptable work (e.g., steps, procedures, practices, rules, policies, theories, principles, and concepts) and the nature and extent of the skills needed to apply those knowledges. To be used as a basis for selecting a level under this factor, a knowledge must be required and applied.

Level 1-2 -- 200 points

Employees use knowledge of fundamental computer operating rules and procedures and knowledge of a few basic computer commands in order to operate small computer system by activating such systems or devices, loading tapes, disks, or other memory devices and initiating processing through a few standardized switch settings or command entries. They also use this knowledge to perform minor adjustments or corrections in the equipment operated such as cleaning tape tracks, restarting tapes, loading printer paper and other similar control and correction actions. Problem conditions that will not respond to external controls or conditions within the system over which the operators have no control are reported to appropriate personnel for resolution.

Employees use those knowledges in operating small computers that typically involve, for example:

-- a single central processor;

-- a few directly connected peripheral devices such as a disk and/or tape drive, line or character printer, console keyboard, and/or a video display device;

-- processing only one or, at most, two jobs at a time or continuously processing a single kind of application, and;

-- no allowance for operator intervention during a run.

Employees perform a variety of duties in operating such systems by activating, monitoring, changing, and terminating jobs. They monitor the progress of jobs, restart jobs that end abnormally, change media (tape, disk, diskette) or activate different applications programs, and physically or through online procedures transfer data files to other users.

-OR-

Employees who are in training to operate computer systems through a central control console use knowledge of commonly used operating rules, procedures, switch settings, and controls to set up and operate a variety of peripheral devices interconnected in a computer system. Such devices include, for example:

-- tape drives,

-- disk drives,

-- buffer/front end minicomputers,

-- high speed printers,

-- computer output microfilm units and, at times, film processors, and

-- controllers or switch panels for such devices.

Level 1-3 -- 350 points

Employees at this level use knowledge of standardized equipment operating controls, rules, techniques, and procedures and a variety of standardized commands, system messages, and key-in verbs and procedures to activate, monitor, and control computer systems comprised of a number of different devices. Such systems regularly process in multiprogramming operations and contain a number of internal control and utility programs. In systems involving operator control of job

distribution and resource allocations, employee knowledge of system operating capacities and job schedules provides for an optimum mix of recurring and special processing requirements and ensures maximum resource utilization. Employees use the knowledge at this level to operate computers that process data in stored programs covering one or several kinds of subject-matter programs within a mixture of information and data manipulation processes. Employees at this level control and operate systems by:

   -- entering commands to link together internal operating systems and utility programs with applications programs, peripheral equipment, teleprocessing channels, and input/output channels;

   -- releasing jobs from readers, buffers, or operator controlled queues;

   -- assigning tape and/or disk drives to specific jobs;

   -- distributing main memory allocations between batch and teleprocessing work;

   -- restoring part or all of the standard system interconnections after power or equipment failures;

   -- assigning or changing job priorities in order to process high priority work or remove problem jobs from the system.

Employees use this level of knowledge in controlling or learning to control standardized operations in computer systems that typically include many or all of the following features and characteristics:

   -- internal job and workflow control programs (operating system);

   -- from several to many peripheral mass storage devices;

   -- two or more interconnected central processors (multiprocessing);

   -- common processing of several jobs at the same time (multiprogramming);

   -- remote terminal teleprocessing and/or interactive (real-time) connections;

   -- a variety of control equipment such as minicomputers, channel control systems, peripheral equipment switches and others that are similar; and/or

   -- built-in utility programs for compiling, assembling, editing, testing, and debugging new programs and others for dump, restart, and checkpoint controls.

Employees use knowledge of security rules, regulations, and procedures in order to: control access of individuals to computer centers; assist authorized users in terminal access procedures; inform users

about acquiring and using passwords or similar authorization codes for terminal access; and restrict access to data and processed information to authorized individuals or organizations.

Level 1-4 -- 550 points

Employees at this level, in addition to the knowledges at the lower levels, use practical knowledge of an extensive body of standardized, optional, and precedent computer operating and problem-solving rules, procedures, techniques, and methods to operate computer systems and to isolate and resolve recurring problems in one or several computer systems such as those described at the next lower level. Employees use this level of knowledge in performing a variety of standardized and nonstandard operating assignments and in resolving a wide range of common equipment and operating problems. Employees at this level, in addition to activating the computer systems and monitoring normal workflow, perform duties such as:

    -- changing equipment schedules and job priorities;

    -- deciding when to initiate program or data file dumps to print or tape;

    -- directing and/or performing the steps necessary to remount, re-enter, and control job reactivation at restart points or at the state jobs had reached just prior to a failure;

    -- monitoring program tests for indications of problems in device allocations or utilization of appropriate utility programs;

    -- running and monitoring test programs to identify problems or potential for obvious problems, such as pending memory overload; and

    -- correcting or adjusting priorities and workflow.

Employees are responsible for correcting those conditions that will respond to standardized control procedures or precedented options in such procedures and for passing system status, problem diagnosis, and program test results to supervisors, specialists, or other appropriate personnel for resolution.

Some employees at this level also use knowledge of system-operating configurations and equipment characteristics, job control language, and standard utility programs to test internal system operating accuracy or to retrieve and report the results of test programs. The employees perform such tests by, for example:

    -- setting up and running standardized program and system tests;

    -- following instructions for changing equipment alignments and job control sequences;

-- taking system information dumps showing register settings, completed processing steps, system messages, and memory utilization by kind and amount; and

-- retrieving related information that shows what the system is doing and how effectively test programs are processing.

Level 1-5 -- 750 points

Employees at this level use indepth knowledge of standard and nonstandard computer operating rules, procedures, and diagnostic techniques to resolve difficult operating problems. This level of knowledge is used to isolate, identify, and devise means for resolving equipment, channel, circuit, and processing workflow problems when such conditions will not respond to standardized operator controls, such as restart or override methods and techniques. Employees resolve problems ranging from relatively basic through very complex, often when such conditions require extensive periods of attention at malfunctioning devices for which the console operator (normally a lower level operator) cannot leave the control station.

Employees at this level use extensive knowledge of the computer operating systems and built-in utility programs to monitor activities internal to the systems and in searching for and identifying problem conditions that affect system operating efficiency in accepting and processing jobs. This knowledge is used also in reviewing test run requirements and developing unusual system configurations that will allow test programs to process without interfering with ongoing job requirements, or to test such unusual configurations for possible application in normal operations.

Level 1-6 -- 950 points

Employees at this level use practical knowledge of a wide range of interrelated technical methods, principles, and practices of data processing equipment, systems analysis, and programming to analyze, diagnose, and resolve complex operating problems involving a variety of applications programs, internal operating systems, storage media and devices, and interrelationships between host computer systems and remote access and teleprocessing terminals.

Employees use knowledge of both standard and nonstandard equipment operating characteristics and alternative methods for controlling such equipment. They make unusual equipment interconnections and rarely used equipment and channel configurations to direct processing through or around problems in applications and operating systems, equipment, circuits, and/or channels. Such in-depth knowledge of optional interconnections between hardware and operating systems is also used in working under the guidance of specialists to plan, develop, and implement new or revised operating methods, techniques, and procedures for such purposes as testing one of a kind, special purpose, or new standardized operating requirements or activating and adjusting new operating systems.

This level of knowledge typically is used in supporting very large scale multiprocessor and/or multiprogram systems operating in a variety of modes such as batch, demand, realtime, and

teleprocessing. Such systems may be configured in many variations; e.g., input/output channels and access methods, sequences of controllers and buffers (including minicomputer subsystems), and numerous connections to remote terminal and/or processing stations. The knowledge is used, for example, to make decisions and take actions to:

    -- order and interpret system dumps to identify the nature and source of problems;

    -- order and implement backup and recovery procedures;

    -- direct and continuation of important processing operations on degraded systems;

    -- realign equipment configurations to work around hardware or circuit malfunctions; and

    -- similar actions requiring extensive knowledge of equipment, programs, and operating options.

FACTOR 2, SUPERVISORY CONTROLS

The "Supervisory Controls" factor covers the nature and extent of direct or indirect controls exercised by the supervisor, the employee's responsibility, and the review of completed work. Controls are exercised by the supervisor in the way assignments are made, instructions are given to the employee, priorities and deadlines are set, and objectives and boundaries are defined. Responsibility of the employee depends upon the extent to which the employee is expected to develop the sequences and timing of various aspects of the work, to modify or recommend modification of instructions, and to participate in establishing priorities and defining objectives. The degree of review of completed work depends upon the nature and extent of the review, e. g., close and detailed review of each phase of the assignment; detailed review of the finished assignment; spot check of finished work for accuracy; or review only for adherence to policy.

Level 2-1 -- 25 points

The supervisor makes assignments by giving specific detailed instructions on what is to be accomplished, how it is to be done, and the deadline for completion. The employee performs the work within the specific instructions by following detailed guidelines.

The structured nature of the work itself represents a form of control. In addition, the work is spot checked or reviewed in progress by the supervisor or a senior worker who also reviews finished work for adherence to instructions.

Level 2-2 -- 125 points

The supervisor gives instructions for new or nonrecurring work, changes from normal schedules, or new procedures. Within established procedures, the employee independently performs recurring work without specific instructions and makes adjustments to accommodate minor deviations in work

methods based on experience and past practices. Unfamiliar situations or deviations from established practices are referred to the supervisor, computer specialists, or other designated individuals for resolution.

Work in progress is spot checked by the supervisor or an operator of higher grade level to keep abreast of workflow and equipment operating status. The work is checked in detail only when there are indications or reports of problems such as equipment failure, late distribution of products, or similar exceptions to the normal flow of processing. Completed work is reviewed for timeliness, use of proper procedures, and quality of products based on operator logs, system reports, trouble reports, and/or customer comments.

Level 2-3 -- 275 points

The supervisor defines objectives and priorities for established batch and teleprocessing requirements, and informs the employee about changing priorities and unusual deadlines for new work.

The employee identifies the specific work to be done at the beginning of a shift, plans and carries out a schedule or sequence of processing, and submits completed work to users without supervisory review. In accepting new work requirements, the employee independently alters work plans to provide for extended run times, additional memory, allotments of memory between batch and teleprocessing users, and other changes based on past experience and flexibilities within the system. As a result of accepting and satisfying new and modified requirements, the employee commonly makes minor adaptations or develops modified operating procedures for application by the employee and others. The employee seeks supervisory assistance and discusses problem areas, such as processing requests that do not conform with clearly established priorities or have potential for adversely affecting other processing requirements.

Completed work is reviewed for conformity to deadlines and accepted practices on the basis of end-of-shift reports, operator log notes, and responses from technical and functional users regarding the timeliness, quality, and accuracy of work products. Work methods are not normally reviewed.

FACTOR 3, GUIDELINES

This factor covers the nature of guidelines and the judgment needed to apply them. Guides used in this occupation include, for example: equipment manuals, established operating procedures and policies, run books, job schedules, job control instructions, and similar reference materials.

Individual jobs in different occupations vary in the specificity, application, and availability of the guidelines for performance of assignments. Consequently, the constraints and judgmental demands placed upon employees also vary. For example, the existence, of specific instructions, procedures, and policies may limit the opportunity of the employee to make or recommend decisions or actions.

Guidelines should not be confused with knowledges described under Factor 1, Knowledge Required by the Position. Guidelines either provide reference data or impose certain constraints on the use of knowledges.

Level 3-1 -- 25 points

Handbooks or job instructions are available and are written in step-by-step sequence or are presented orally in detail and are readily memorized. They are complete, specific, and permit n deviation of their application to setting up, operating, or scheduling the work or in the steps to follow in the event of problems. Employees work strictly according to the guidelines, referring all exceptions to the supervisor.

Level 3-2 -- 125 points

At this level, employees use a number of written guidelines including equipment operating manuals, local schedules, procedures and special operating instructions, and others that are detailed as to what is to be done and how to evaluate and resolve frequently encountered problems. Selection of an appropriate guideline for specific conditions or circumstances is usually clear cut. The guidelines provide for the operator to use some personal judgment in deviating from established work methods and procedures. The operator might, for example, evaluate job requirements and choose the best running techniques from among several alternatives, or may choose from several options for aligning equipment around mechanical problems. Also, operators adjust schedules to allow for high priority jobs, and to avoid unforeseen job contention for access to memory and data elements. Unusual conditions for which precedents have not been established, or for which established options will not work are referred to the supervisor or other designated individual.

Level 3-3 -- 275 points

At this level, the employee is, as a regular assignment, designated to review and resolve operating problems or conditions that are not specifically covered in established guidelines or involve conditions not previously encountered. Such problems or conditions are covered only generally in the guidelines and the employee uses judgment in interpreting and adapting guidelines such as operating manuals, run books, and established work methods to fit new processing requirements or resolve unusual equipment problems. Such work may involve, for example, working with specialists to install changes in computer operating systems or equipment, develop new operating procedures, and incorporate changes into or in place of existing guidelines.

FACTOR 4, COMPLEXITY

This factor covers the nature, number, variety, and intricacy of tasks, steps, processes, or methods in the work performed; the difficulty in identifying what needs to be done; and the difficulty and originality involved in performing the work.

Level 4-1 -- 25 points

Employees perform tasks that are clear-cut, repetitive, and directly interrelated, such as operating a special purpose "minicomputer," responding to a few specific console messages such as those requesting tape mounting and assigning tape drives to specific jobs, controlling routine data transfers, and similar tasks. The nature of the work provides little opportunity for the employee to decide what is to be done or the methods to be used.

Level 4-2 -- 75 points

Employees at this level perform a variety of related tasks involving standardized methods and procedures for operating computer systems that process multiple programs (either multiple batch work or a combination of batch and teleprocessing work). These tasks, methods, and procedures are performed in operating computer systems that involve, for example:

-- internal supervisory software for scheduling input and output and controlling the internal separation and processing steps for many jobs that are processing simultaneously,

-- messages to the operator about equipment requirements for specific jobs,

-- system alerts to the operator about equipment and program problems.

The employees decide what needs to be done in setting up and maintaining the flow of work for recurring and special jobs and in resolving recurring kinds of operating problems according to established procedures. Employees identify conditions that require operator control or intervention and then, for example, carry out standardized work methods to:

-- initiate system or program dumps,

-- stop or restart jobs,

-- switch to alternate equipment,

-- seek assistance from repair technicians.

-- prepare operator trouble reports about unusual or persistent problems for solution by others.

The actions to be taken differ based on the status of the system in terms of:

-- the amount and mixture of equipment available,

-- job demands on memory,

-- the nature of problems with equipment and programs,

-- the variety of vendors responsible for maintaining equipment,

-- problems in established circuits and electrical channels,

-- the nature of messages received from the system at the operator's console.

The employee selects and applies different procedures and methods according to the facts presented.

Level 4-3 -- 150 points

At this level, employees perform a variety of problem-solving or other special assignments often requiring different and unusual approaches; for example, resolving operating problems that cannot be readily resolved by console operators applying standardized work procedures and techniques.

The employee decides what to do by:

-- studying each assignment,

-- analyzing the problem situations encountered,

-- analyzing the results of test programs.

The employee chooses or devises a course of action from among several alternatives and makes adaptations to fit the specific conditions involved.

The work involves conditions that must be identified and analyzed by the employee to discern interrelationships. Such conditions include, for example, the nature of problems encountered, the kind of equipment involved, and the impact of alternate approaches on test or ongoing processing operations.

Level 4-4 -- 225 points

This level is distinguished from the previous level by: (1) the variety and complexity of operating systems monitored; (2) the nature and variety of problems encountered and resolved; and, (3) the nature of independent decisions made by the employee. At this level the employee typically monitors the operations of several major computer systems. Programs run on these systems are a mix of independent and interdependent applications. Specifically, the employee at this level performs problem-solving duties involving a wide range of problem or error conditions in equipment, program, data, and processing methods and procedures. The employee arrives at solutions or develops new procedures through diagnosis and resolution of error and problem conditions involving equipment

configurations having different operating characteristics, a wide variety of data and programs, and many different processes and methods.

Decisions regarding what needs to be done include assessing unusual circumstances or conditions, developing variations in approach to fit the specific problems, or dealing with incomplete or conflicting data. For example, in cases of major equipment failure or excessive/ unexpected amounts of input data, the employee commonly takes a series of actions affecting a number of programs. This can include decisions to transfer programs to other computer systems, remove jobs from an operating schedule, reassign equipment allocations to work around program software or equipment deficiencies, and similar actions.

The employee makes decisions and devises solutions based on program, equipment, and systems knowledge. This involves interpreting considerable data to identify the problems, planning and implementing solutions, and refining or designing operating methods or techniques.

FACTOR 5, SCOPE AND EFFECT

Scope and Effect covers the relationship between the nature of the work, i.e., the purpose, breadth, and depth of the assignment, and the effect of work products or services both within and outside the organization.

In this occupation, effect measures such things as whether the work output facilitates the work of others, provides timely services, or impacts on the adequacy of research conclusions. The concept of effect alone does not provide sufficient information to properly understand and evaluate the impact of the position. The scope of the work completes the picture, allowing consistent evaluations. Only the effect of properly performed work is to be considered.

Level 5-1 -- 25 points

Employees perform specific repetitive tasks in operating small, single purpose computer systems; processing several different applications, one at a time, on a system that allows such individual job controls; or operating online peripheral equipment as a part of basic computer operator training. The results of the work provide products for, and facilitate the timeliness of, other work processes in computer operations or very limited aspects of subject-matter organizations.

Level 5-2 -- 75 points

Employees at this level perform a range of duties in operating and controlling one or more computer systems through control consoles according to established procedures, work methods, and equipment operating techniques. They also identify and correct common, recurring error and problem conditions in operating computer systems according to specific procedures and methods. The results of the work are completed computer processing products used in other subject-matter processes or system reports used by analysts to determine why equipment or programs failed to operate properly.

Results of the work affect the reliability and acceptability of subsequent data processing and subject-matter processes by assuring a continuous processing workflow, correcting processing failures, assuring proper interconnections between the host computer and terminal users, and providing timely products.

Level 5-3 -- 150 points

The work at this level is distinguished from the lower levels by the addition of problem-solving responsibilities which, although conventional to data processing, are not always covered by established or standardized procedures. Situations encountered include, for example: console error messages that identify only partial or incorrect leads to problem sources in equipment, circuits, or channels; operating problems requiring the employee to develop operating procedures associated with the installation of new operating systems or revisions to existing systems; recurring errors that fail to respond to established procedures or key-in techniques; and others requiring analysis of operating conditions in order to define problems and develop solutions in consonance with general operating and production criteria.

The results of the work affect the efficiency of workflow and the quality of data processing products and services and the adequacy of products used in subsequent processes.

FACTOR 6, PERSONAL CONTACTS

This factor includes face-to-face contacts and telephone and radio dialogue with persons not in the supervisory chain. (NOTE: Personal contacts with supervisors are covered under Factor 2, Supervisory Controls.) Levels described under this factor are based on what is required to make the initial contact, the difficulty of communicating with those contacted, and the setting in which the contact takes place; e.g., the degree to which the employee and those contacted recognize their relative roles and authorities.

Above the lowest level, points should be credited under this factor only for contacts which are essential for successful performance of the work and which have a demonstrable impact on the difficulty and responsibility of the work performed.

The relationship of Factors 6 and 7 presumes that the same contacts will be evaluated for both factors. Therefore, use the personal contacts which serve as the basis for the level selected for Factor 7 as the basis for selecting a level for Factor 6.

Level 6-1 -- 10 points

Personal contacts are with other employees in the immediate unit and with specialists, tape librarians, schedulers, and others in directly related units either in person, over the counter, or by telephone.

Level 6-2 -- 25 points

Personal contacts are with specialists in data processing and subject-matter areas outside the immediate organization and with other users of data processing services and products such as recipients of printed products and users of terminal stations. The contacts may be initiated by either party and the role of each participant and the purpose of the contacts are readily established. Personal contacts are also made with vendor representatives concerning equipment failures and scheduled maintenance.

FACTOR 7, PURPOSE OF CONTACTS

In General Schedule occupations, purpose of personal contacts ranges from factual exchanges of information to situations involving significant or controversial issues and differing viewpoints, goals, or objectives. The personal contacts which serve as the basis for the level selected for this factor must be the same as the contacts which are the basis for the level selected for Factor 6.

Level 7-1 -- 20 points

The purpose of contacts is to provide or exchange factual information on, for example, the status of jobs, the operation of the system, or equipment trouble reports. Employees also notify users about finished work or similar facts, or explain established work methods, processes, and schedules.

Level 7-2 -- 50 points

The purpose of contacts is to plan or coordinate work efforts or resolve questions about such topics as unusual operating or equipment problems, procedures for testing and installing new software variations, or the development of new operating procedures to accept new or modified processing requirements.

FACTOR 8, PHYSICAL DEMANDS

The "Physical Demands" factor covers the requirements and physical demands placed on the employee by the work assignment. This includes physical characteristics and abilities (e.g., specific agility and dexterity requirement) and the physical exertion involved in the work (e.g., climbing, lifting, pushing, balancing, stooping, kneeling, crouching, crawling, or reaching). To some extent, the frequency or intensity of physical exertion must also be considered; e.g., a job requiring prolonged standing involves more physical exertion than a job requiring intermittent standing.

NOTE: Regulations governing pay for irregular or intermittent duty involving unusual physical hardship or hazard are in subpart I of part 550 of title 5, Code of Federal Regulations.

Level 8-1 -- 5 points

The work is sedentary. Typically, the employee may sit comfortably to do the work. However, there may be some moving around to adjust equipment; carrying of light items such as papers, books, or small parts; driving an automobile, etc. No special physical demands are required to perform the work.

Level 8-2 -- 20 points

The work requires extended regular and recurring periods of caring for or performing minor repairs on equipment and carrying or loading paper, tapes, or cards that weigh as much as 45-50 pounds.

FACTOR 9, WORK ENVIRONMENT

The "Work Environment" factor considers the risk and discomforts in the employee's physical surroundings or the nature of the work assigned and the safety regulations required. Although the use of safety precautions can practically eliminate a certain danger or discomfort, such situations typically place additional demands upon the employee in carrying out safety regulations and techniques.

NOTE: Regulations governing pay for irregular or intermittent duty involving unusual physical hardship or hazard are in subpart I of part 550 of title 5, Code of Federal Regulations. .

Level 9-1 -- 5 points

The work involves the common risks or discomforts (requiring normal safety precautions) typical of offices, meeting rooms, libraries, and the like. The work area is adequately lighted, heated, and ventilated. Employees in or adjacent to computer rooms may be within environmentally controlled areas which, although relatively cool, require only normal clothing to compensate for minor discomfort.

Level 9-2 -- 20 points

The work involves moderate risk requiring exercise of safety precautions when operating or working around equipment with exposed moving parts such as decollators, bursters, and others. Special clothing or protective equipment is not normally required although there is moderate risk of bodily injury.

OPM BENCHMARK DESCRIPTIONS

COMPUTER OPERATOR, GS-0332-03, BMK#: 1

Duties:

Operates two minicomputer systems through a control console. One system serves as a data entry host for correspondence control information fed directly from microfilm terminal stations and the other stores the data for inquiry, document locator access, and related correspondence information services. Each system consists of a central processor containing control and utility programs, one tape drive, one disk drive, and digit controlled console. In addition, there is a card reader that is used with both systems.

-- Cold starts systems by mounting and activating an input tape to enter the standardized operating system to disk memory and entering prescribed commands through a terminal to activate the systems to receive from or provide data to terminal stations.

-- Periodically dumps input data from disk to tape storage and then mounts tape to provide input to the inventory/locator disk records in the second system.

-- Identifies equipment problems such as hung tapes, failure to respond to key-in commands, or tape vacuum column leakage and attempts to correct by standardized procedures. Notifies designated technical personnel about problems that fail to respond to controls and describes over the telephone the nature of the problem. As advised, enters commands, makes minor mechanical adjustments and similar other actions to correct problems, reports success or failure to technical personnel.

-- Searches printed error reports, identifies duplicate or misidentified correspondence records, punches correction cards, and enters corrections to the inventory data base.

-- Periodically purges closed correspondence records from disk memory.

Factor 1, Knowledge Required by the Position -- Level 1-2 -- 200 points

-- Knowledge of a few basic, standardized and frequently used rules and procedures is used to start computer systems, monitor operations in progress, and resolve commonly recurring operating problems. This knowledge is used in initiating operations from power off (cold-start) and power on (warm-start) conditions, identifying and correcting minor equipment error problems, and describing more difficult problems to appropriate technical personnel for assistance or solution.

-- Knowledge of correspondence identification keys is used to review error lists and enter corrections to the correspondence control and inventory data base through a digital control console.

-- Knowledge of operating procedures and techniques for a few pieces of peripheral equipment is used in mounting tapes on tape drives, entering data through a card reader, and entering commands and data corrections through a control console.

Factor 2, Supervisory Controls -- Level 2-2 -- 125 points

The work is assigned by the supervisor in general terms such as the hours of operations for the data entry and inventory control systems, general methods for identifying and correcting equipment and data errors, and responsibility for deadlines.

The employee performs the work independently and makes adjustments to accommodate minor deviations in work methods based on experience and past practices, such as those concerning minor adjustments in tape drives or the card reader, errors of duplication, number reversal, and similar problems in data error listings. For unusual equipment or program problems, the employee determines who to contact and how far to carry such problem-solving processes prior to informing the supervisor about the effect of the problem on user information requirements.

Finished work is reviewed for timeliness and accuracy based on operator logs and records and information reported by system users.

Factor 3, Guidelines -- Level 3-1 -- 25 points

The guidelines are very clear for circumstances normally encountered by the employee. They consist of written manuals and procedures developed by the manufacturer and internally developed operating procedures, schedules, and operating methods. The guidelines are complete and allow for little or no deviations except those established by precedent actions. All exceptions are reported to the supervisor or through direct contact with a vendor's representative for solution.

Factor 4, Complexity -- Level 4-1 -- 25 points

The employee performs tasks that are clear cut, repetitive, and directly interrelated. The same operating systems, programs, and equipment are operated on a daily basis and the majority of error and problem conditions are recurring and their solution is generally very straight forward within established procedures and methods. The nature of the computer systems and the work itself provide little opportunity for the employee to decide what is to be done or the methods to be used.

Factor 5, Scope and Effect -- Level 5-2 -- 75 points

The employee performs a narrow range of duties involving the operation of two minicomputer systems composed of remote data entry, central processors, tape and disk drives, card readers, and control consoles used in receiving, organizing, and storing locator and control information for a very large automated correspondence control system. The results of the work are locator, status, deadline, and similar records concerning the receipt and response status of correspondence from public and private officials, annuitants, and others.

Results of the work affect the reliability, acceptability, and timeliness of subject-matter processes concerned with providing responses about annuity and other benefit considerations.

Factor 6, Personal Contacts -- Level 6-2 -- 25 points

Personal contacts are with employees in data entry and other related units and with vendor representatives responsible for equipment software and hardware maintenance.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 points

The purpose of contacts is to provide or exchange factual information concerning system status, error corrections in the data base, and error or problem conditions in the computer systems.

Factor 8, Physical Demands -- Level 8-1 -- 5 points

The work is sedentary, typically allowing the employee to sit while performing the majority of duties. There may be some short periods of bending, standing, walking, or carrying of light items such as punched cards, paper reports, and similar items. There are no special physical demands for performing the work.

Factor 9, Work Environment -- Level 9-1 -- 5 points

The work involves the risks, discomforts, and normal safety requirements common to such places as offices, meeting or training rooms, libraries, and similar work locations. The work area is adequately lighted, heated, and ventilated.

TOTAL POINTS -- 505

COMPUTER OPERATOR, GS-0332-04, BMK#: 1

Duties:

The employee operates a small stand-alone computer system that accepts work and performs a mixture of: receiving data entered from a number of terminal stations; serving as a remote job entry terminal for two different large scale computer systems in other locations; and performing some independent processing of small applications programs. Typically, several of such applications are processed simultaneously under the control of the computer operator.

   -- Activates standardized system control programs and associated tape, disk, and teleprocessing equipment.

   -- Mounts tapes and activates disk units to load programs for remote job entry to two separate host computers at other locations and separate mounts for jobs to be processed locally.

   -- Activates entry channels and provides for tape and disk memory drives for use by terminal operators engaged in key-to-tape or key-to-disk data transcription operations.

   -- Monitors system operations in order to identify times for changing tape mounts for scratch and program tapes, change disk pack allocations to accept or transmit work, and detect system messages indicating problems in disk or tape drives or in communications channels.

   -- Corrects tape feed problems and other minor problems in tape drives such as covers that fail to close tightly, moves tapes to load point when automatic load mechanisms stick or fail to operate, reset modems in attempting to clear communications channel alignments, detects and overrides tape and disk parity errors, and corrects similar error or problem conditions according to operator manual instructions and standing operating procedures.

   -- Sets up and releases each batch job to the system and controls the release of remote entry jobs to their respective host mainframe systems.

   -- Sets up and releases each batch job to the system and controls the release of remote entry jobs to their respective host mainframe systems.

   -- Follows prescribed operating schedules, looks for potential data contentions, and readjusts schedules to allow for predecessor requirements, where the output from one step is required to complete processing in later steps or jobs.

Factor 1, Knowledge Required by the Position -- Level 1-3 -- 350 points

-- Knowledge of standardized equipment operating methods, techniques, and procedures are used in setting switches and controls and entering standard setup, job release, and output controls through a computer control console. This knowledge is used also in detecting errors and equipment malfunctions and following manufacturer's and locally developed procedures in resetting equipment controls and entering commands through the terminal to correct error conditions.

-- Knowledge of the system job control language is used in setting up jobs, completing job entry card decks, assigning specific devices, and correcting control errors associated with those and other job stream controls.

Factor 2, Supervisory Controls -- Level 2-2 -- 125 points

The supervisors provide specific instructions for new jobs or changes in the operating system and defines new schedule and deadline requirements.

The employee performs recurring production and remote job entry work independently and resolves problems in the system in magnetic media, equipment control channels, and in some of the equipment itself by following established methods and procedures. Jobs or equipment that fail to process or perform properly in response to normal operating techniques are reported to the supervisor or technical service personnel for solution.

Work in progress is spot checked by the supervisor when there have been program or equipment errors or problems are anticipated in introducing new programs into the system. Completed work is reviewed for conformity to standing and special instructions and for timely compliance with established production schedules.

Factor 3, Guidelines -- Level 3-2 -- 125 points

The employee uses a variety of manufacturer and locally developed manuals that describe program set ups and operating procedures and the methods for activating, controlling, and correcting faults in equipment operations. The guidelines are complete and cover the majority of situations encountered in detail, although the employee exercises judgment in selecting and applying the guidelines in specific conditions or situations. Refers problems to the supervisor or a more experienced operator when established SOP's and operating options will not provide solutions.

Factor 4, Complexity -- Level 4-2 -- 75 points

The employee performs a few different, although related, tasks in operating a small computer system that processes a variety of different kinds of jobs in multi-programming operations that include batch and teleprocessing work. The employee uses standardized methods, techniques, and operating procedures to perform the work.

The employee decides what needs to be done in setting up, resolving errors, and maintaining the flow of processing by choosing from among a few alternatives in operating procedures, job sequencing alternatives related to schedule, equipment or program changes, or other conditions that are readily recognizable.

Actions taken by the employee differ according to the source of problems in the system, changes in standing operating procedures, loss of processing ability for remote job entry work because of failures in the host computers, and others that are evident.

Factor 5, Scope and Effect -- Level 5-2 -- 75 points

The employee performs work involving the execution of specific rules, procedures, methods, and techniques in operating and controlling a small scale computer system. The results of the work are completed segments of larger projects such as the output reports that result from local batch processing or interim segments of other work processes such as data entry compilations that must be transferred to other systems to arrive at completed products.

The results of the work affect the reliability and acceptability of subsequent data processing and subject-matter work processes. Correcting equipment errors and maintaining continuity of operations provide timely services and products to users.

Factor 6, Personal Contacts -- Level 6-2 -- 25 points

Personal contacts are with technical specialists in the immediate and related units and with vendor representatives concerned with providing maintenance and processing service.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 points

The purpose of contacts is to explain the processing services that are available through the system, the current status of the system and jobs that are processing or are scheduled for processing, and the symptoms of error and problem conditions that will respond to standardized correction procedures.

Factor 8, Physical Demands -- Level 8-1 -- 5 points

The work is primarily sedentary, allowing the employee to sit to perform much of the work. There is some standing, walking, bending, and stooping in loading tapes, checking problem conditions in the equipment and other work away from the control console. There is also some light lifting of items such as punched cards, magnetic tapes, and disk packs. There are no special physical demands required to perform the work.

Factor 9, Work Environment -- Level 9-1 -- 5 points

The work involves the common risks or discomforts, requiring normal safety precautions, such as apply to offices, meeting or training rooms, libraries, and the like. The work area is adequately lighted, heated, and ventilated and, although relatively cool, requires only normal clothing to compensate for minor discomfort.

TOTAL POINTS -- 805

COMPUTER OPERATOR, GS-0332-05, BMK#: 1

Duties:

Performs as backup operator on an assigned large scale system console. On a regular basis, operates a variety of general purpose computer equipment and related auxiliary and peripheral devices in different modes (batch, real time, offline, and/or online) to process a wide range of applications programs (recurring, special, intermittent, one-of-a-kind).

  -- Sets up and readies equipment for operation; sets control switches; performs initiation and booting operations; loads utility programs; uses data entry switches and indicators to read, store, and display data; and enters inputs. The equipment includes a variety of devices; e.g., digital plotters, tape-to-paper and key-to-disk-to-tape systems, remote job entry, etc. Monitors, interprets, and responds to terminal/console messages.

  -- Sets up and operates peripheral devices such as disk and tape drives, multispeed printers, card readers, and punches. Prepares equipment by setting control switches, changing disks, mounting tapes, preparing labels, and loading paper or forms. Stops machines as necessary; utilizes appropriate guidelines to resolve minor mechanical problems with equipment.

  -- Receives training on large scale multiprogramming/ multiprocessor systems console operations. Operates as backup operator under the guidance of a supervisor or higher level operator.

  -- Isolates the nature of system failures and equipment problems; within available guidelines, initiates appropriate corrective action to maintain production schedules and ensure the quality of processing. Refers to the supervisor or higher grade operator any systems failures and equipment problems which do not respond to standardized corrective procedures as well as situations in which production schedules cannot be met.

  -- Prepares systems logs and other records of computer operations including documentation of equipment operations problems, system malfunctions, system status, etc., and any corrective action taken.

-- Monitors program and equipment tests; implements standardized test procedures to resolve problems. Documents program and equipment performance information for use by systems analysts and programmers.

Factor 1, Knowledge Required by the Position -- Level 1-4 -- 550 Points

-- Detailed knowledge of the data center's general purpose computer equipment, communications links, and peripheral devices, including operating methods and characteristics, in order to set up and operate the equipment.

-- Working knowledge of operating systems, utility software, and job control languages to initiate and monitor processing of production workloads.

-- Knowledge of production workloads in terms of individual job requirements and priorities to complete work schedules on time.

-- Working knowledge of standard computer operating procedures, rules, and methods to operate equipment and to identify and resolve recurring kinds of operating problems.

-- Knowledge of systems logs and other documentation requirements to maintain information about computer operations and to describe problems to higher level operators and the supervisor.

Factor 2, Supervisory Controls -- Level 2-2 -- 125 Points

Instructions for new or special workloads, schedule changes, or revised procedures are usually provided by the supervisor; however, higher level operators may also communicate this information to the employee.

The incumbent normally works independently to complete assignments in accordance with instructions, schedules, and guidelines. Operator makes minor adjustments, as necessary, to schedules or procedures when conditions warrant. The supervisor or higher level operator is available to provide technical guidance on problems not responsive to normal corrective measures.

The supervisor or higher level computer operator periodically spot checks the employee's performance on the large scale console. Completed work is reviewed on the basis of operator logs, schedule completion, and user feedback on the quality and timeliness of products.

Factor 3, Guidelines -- Level 3-2 -- 125 Points

Guidelines consist of operations manuals and procedures, memoranda, technical documentation, vendor-supplied operator's manuals, and verbal instructions which provide information on equipment operation, workload requirements, and error resolution. They cover most situations encountered. Employee exercises judgment in adjusting priorities to work around faulty equipment, and in

determining optimum method of accomplishing workloads within established schedules. Situations not covered, questionable, or not responsive to normal corrective procedures are referred to supervisor or higher level operator.

Factor 4, Complexity -- Level 4-2 -- 75 Points

Employee performs a variety of related tasks involving different workload requirements to process multiple programs (combination of batch work, remote job entry work, teleprocessing work, etc.), fluctuating input and output requirements, and special purpose equipment. The employee reviews each production request in relation to the resources required and available, schedules to be met, relationships among the jobs to be processed, and the nature of known problems with equipment resources and programs. The number and sequence of steps vary with each job to be processed, and the employee must be cognizant of these variable factors to accomplish scheduled workloads and to resolve problems by interpreting and applying standard procedures.

Factor 5, Scope and Effect -- Level 5-2 -- 75 Points

The work involves operating and controlling a variety of computer and peripheral equipment using established methods and procedures. The operator is responsible for identifying and resolving equipment problems and processing conditions. The results of the work affect the efficiency of the workflow, quality of data processing production and services, and the adequacy of the products.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Contacts are usually limited to employees in the immediate area (supervisors, higher level operators) and personnel in related areas such as schedulers and programmers.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 Points

The purpose of the contacts is to exchange information on problems with equipment operations, provide workload status information, and provide or obtain assistance.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work regularly requires extended periods of walking, bending, and stooping; lifting and carrying reels of tape, disk packs, stacks of paper, and trays of cards weighing up to 30 pounds; pushing tape carts weighing as much as 200 pounds up ramps leading to computer rooms.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Although the work is performed in a temperature-controlled setting and moderately high noise levels, no unusual risks or discomforts are present in the job. Incumbent is required to adhere to security procedures while in the computer operations areas.

TOTAL POINTS -- 1020

COMPUTER OPERATOR, GS-0332-06, BMK#: 1

Duties:

Employee operates a high speed digital computer system processing batch and real time applications programs for a procurement and supply system. In addition to operating the system and resolving common error conditions, employee is responsible for recognizing, diagnosing, and independently acting on commonly occurring machine stoppage and error situations that may not be fully covered by existing procedures and guidelines.

-- Makes appropriate computer console settings to activate internal control and utility programs; activates peripheral devices by setting switches and making console key-in to link the various devices with the control programs and main memory. Loads programs and begins operations for the shift.

-- Powers on front-end processors and modems to provide access from remote job entry and inquiry terminal stations.

-- Monitors job flow for program load requirements, tape mounts, sign-on by terminal stations, and output device requirements and to identify messages and indicators of system problems in programs and equipment.

-- Initiates corrective actions in situations where unanticipated or difficult machine stoppages or program errors occur for which prescribed operating instructions are inadequate. Deviates from guidelines in attempting to resolve equipment problems before calling vendor customer engineers for service.

-- Adds new tested program capabilities to computer system, makes provision in command structure and memory devices for storing new data bases, and closely monitors program operations for errors or for smooth blending with existing stored program structure.

-- Notifies specialists of program errors and follows instructions in making changes in job control entries or in resetting program operations at other than prescribed restart checkpoints.

-- Reviews processing schedules, run sheets, and related instructions to identify precedent processing requirements and potentials for program or data base contention in order to restructure operating schedules and priorities when recovering from interrupted operations.

Factor 1, Knowledge Required by the Position -- Level 1-4 -- 550 points

   -- Knowledge of the operating system and associated equipment configurations, including peripheral and teleprocessing equipment and connecting channels, to enter and maintain a constant flow of programs/jobs through the system and to monitor the system to identify the nature and source of problems in programs and equipment and report program errors to appropriate specialists. The operator uses knowledge of the equipment in the system to diagnose the nature of problems, reset switches and other controls, make minor mechanical adjustments, and perform similar tasks to maintain or restore equipment operations.

   -- Knowledge of subject-matter program processing requirements to revise operating schedules, change priorities for jobs in progress or in queue, or withhold work from processing to make memory and program routines available for high priority work products.

   -- Knowledge of system control language and terms for console commands to direct work around troublesome equipment, reconfigure the system to function with reduced memory capacities, or increase the amount of main memory available to applications and test programs. This knowledge is also used to install new programs and modifications developed by specialists.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

The supervisor defines objectives and priorities for established batch and teleprocessing requirements and informs the employee about changing priorities and unusual deadlines for the work.

The employee identifies the specific work to be done at the beginning of the shift, plans and carries out a schedule or sequence of processing, and submits completed work to users without supervisory review. In accepting new work requirements, the employee independently alters work plans to provide for extended run times, additional memory requirements, allotments of memory between batch and teleprocessing users, and other changes based on past experience and flexibilities within the system. As a result of accepting and satisfying new and modified requirements, the employee commonly makes minor adaptations or develops modified operating procedures for application by self and others.

Completed work is reviewed for conformity to deadlines and accepted practices based on end of shift reports, operator log notes, and responses from technical and subject-matter users regarding the timeliness, quality, and accuracy of work products. Work methods are not normally reviewed.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

The work is described and covered in a variety of manuals and handbooks, such as those provided by equipment manufacturers and those developed as standard operating procedures within the organization. The guidelines cover the vast majority of recurring operational conditions and software

and equipment problems. However, for very new (already tested) applications programs and some equipment problems that fail to respond to conventional override techniques, there are gaps in the specificity of the guidelines requiring the use of judgment by the employee to interpret the intent of the guides and adapt them to specific problem conditions. The employee prepares written reports about the approaches taken in resolving problems and suggests changes in standard operating procedures.

Factor 4, Complexity -- Level 4-2 -- 75 Points

The work consists of computer operating and error correction duties involving related processes, techniques, and work methods. The employee decides what needs to be done based on recognizing the existence or absence of normal processing capacities. Indicators of improper operations are readily recognized, either through console system messages or by observing that work products are failing to meet established criteria.

Actions taken by the employee differ in such things as the specific devices or program capabilities involved, the kinds of messages produced at the console, or similar conditions that clearly indicate the kind of actions that are required.

Factor 5, Scope and Effect -- Level 5-2 -- 75 Points

The work involves the execution of computer rules, procedures, and operating techniques. It typically comprises a complete segment of data processing cycles, providing processed information for use in further systems and subject-matter processes. The employee also resolves common error and problem conditions occurring in computer equipment and program controls.

Results of the work affect the reliability and acceptability of subsequent data processing and subject-matter processes by assuring proper interconnections between the host computer and its related components in order to provide timely and accurate products for users.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Personal contacts are with other employees in the immediate unit and with specialists, tape librarians, vendor's customer engineers, and others in directly related units who are involved in or concerned with maintaining continuous workflow and efficient operations in the computer system.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 Points

The purpose of contacts is to provide, exchange, and discuss such factual information as the status of jobs, system operating status, and equipment trouble reports or to explain established work methods, processes, and processing schedules.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is primarily sedentary, allowing the employee to sit comfortably to do most of the work. There may be some regular and recurring walking, standing, bending, or carrying of light items such as computer products, decks of punched cards, and small equipment parts. No special physical demands are required to perform the work.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work involves common, everyday risks or discomforts, requiring normal safety precautions typical of offices, meeting or training rooms, libraries, and the like. The work area is adequately lighted, heated, and ventilated and, although relatively cool because of environmental controls, requires only normal clothing to compensate for minor discomfort.

TOTAL POINTS -- 1305

COMPUTER OPERATOR, GS-0332-07, BMK#: 1

Duties:

Incumbent operates any one of several high-speed, large-scale computer systems processing batch and teleprocessing applications programs as well as performing developmental and production testing. As the control console operator, independently investigates and resolves operating and equipment problems. Participates in the installation of new or modified operating systems and equipment. Provides technical guidance and direction to lower level operators.

-- Activates large-scale computer system by powering on control console, loading the appropriate operating system, entering commands to connect the large-scale central processor(s) and operating system with associated hardware resources such as tape and disk drives, activating teleprocessing access channels, identifying malfunctioning equipment that is unavailable, and entering starting point data.

-- Insure the total availability of the large-scale computer system(s), which includes single and multiconnected processors, magnetic tape units, magnetic disk units, impact printers, laser printers, card reader-punches, consoles, label printers, and remote terminals.

-- Monitors system status and performance by observing system messages, requesting control console display of status information, and responding promptly to messages displayed on the control console to avoid message backlogs or system deterioration.

-- Monitors job flow and system utilization by entering commands through control console to assure effective and efficient processing. Selects jobs to be processed concurrently based on

available resources and acceptable I/O-CPU matching criteria to prevent memory fragmentation and degradation of system performance.

-- Independently switches hardware equipment from online to offline mode, and vice versa, and switches equipment from one large-scale computer system to another when required by production or test workload requirements or priority requirements.

-- Investigates system malfunctions to determine the cause; i. e., hardware, software, or environment. Defines and isolates the specific problem, using available diagnostic and error recovery techniques, and independently initiates corrective action. As required, contacts vendor engineers, computer hardware specialists, and systems software specialists to determine the cause of problems resistant to available problem solving techniques. Informs supervisor of the action taken.

-- Prepares written reports on job delays, system malfunctions, and other operational difficulties or problems and reviews these reports with appropriate specialists and shift personnel.

-- Assists systems programmers and analysts in conversion to more advanced levels of operating systems. Participates in test runs and makes comprehensive reports of any significant operating occurrences.

-- Assists computer equipment specialists in the installation of new equipment and reinstallation of existing equipment. Participates in installation diagnostic procedures and in testing the newly installed equipment before release to the production environment.

-- Participates in shift turnover activities by discussing with incoming shift peers, work in progress, problems relating to production schedules, system status, equipment malfunctions, and other operational problems.

-- Provides technical training and guidance to lower level operators. Resolves system and equipment problems referred by lower level operators.

Factor 1, Knowledge Required by the Position -- Level 1-4 -- 550 Points

-- Knowledge of the large-scale operating systems (e.g., MVT, MVT/HASP, MVS/JES2, MVS/JES3, MVS-SP and ASP) used in entering and maintaining a constant flow of programs/jobs through the computer system(s).

-- Knowledge of the hardware equipment configurations and interconnecting components used to activate, control, and monitor the equipment and to diagnose the nature of problems, reset switches and other controls, make minor mechanical adjustments, and perform similar tasks to maintain or restore equipment operations.

-- Knowledge of the production workflow requirements used to coordinate the allocation of required equipment and memory resources and to ensure that input and output requirements are met by changing priorities for jobs in progress or by withholding work from processing in order to make the required resources available.

-- Knowledge of restart and recovery procedures for all large-scale system components used to identify and quickly initiate action to restore equipment operations or to switch other available equipment to expedite production processing and avoid unnecessary stoppages.

-- Knowledge of internal schedules and associated procedures, remote terminal procedures, job priority categories, system control language and terms for console commands used to direct work around malfunctioning equipment, reconfigure the system to function with reduced resources, and to direct output work products destined to remote locations to an alternate location when a problem is encountered in the telecommunications link.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

The supervisor defines the objectives and priorities for the production and testing workloads and informs the employee about special priorities and deadlines.

At the beginning of a shift, the employee plans and executes a schedule of the specific work to be processed and independently changes that schedule to accept new work requirements by reallocating memory and/or equipment resources or by other changes based on past experience with the flexibilities of the system. The employee identifies and resolves processing problems within the framework of available guidelines. The employee seeks supervisory assistance when the schedule established at the beginning of the shift will be adversely affected by a change in workload requirements or computer system resources. Completed work products are submitted to the requestor without supervisory review. The employee adapts or develops modified operating procedures or work methods for application on any of the large-scale computer systems.

The supervisor reviews work for conformity to schedule on the basis of production workload reports, shift logs, operator logs, and comments from users about the timeliness and quality of output work products. Work methods are not normally reviewed.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

The employee uses vendor operating procedures and hardware manuals, and internally developed standardized operating and diagnostic procedures for control console operations and for each system hardware component. Other guidelines available include established production schedules, workload requirements, operating procedures for specific large-scale systems, job procedures, and written directives prepared by support personnel. Although guidelines are available, they do not address all circumstances or cover every type of problem encountered. The employee exercises judgment in independently interpreting and adapting guidelines to resolve unusual problems. When working with

operating system specialists and equipment specialists to install changes in the operating system or to install new equipment, the employee assists in developing new or revised operating procedures, which are then tested and incorporated into the existing guidelines.

Factor 4, Complexity -- Level 4-3 -- 150 Points

The work involves operating and problem-solving duties for large scale computer systems operating in a multiprocessing/multiprogramming environment and involving complex workload requirements; i.e., multiple batch jobs processing concurrently or multiple batch jobs processing concurrently with multiple teleprocessing applications. Employee rotates assignments on each of several large scale systems and must be able to operate and interpret the status of specialized computer resources and to thoroughly understand the requirements of a variety of complex production job series processed on each of the systems. To assure continuity of workflow on each of these systems, the employee must use detailed knowledge of a variety of operating systems, the job control language and terminal control language for each operating system, and the immediate impact of alternate equipment configurations available to each system on the work to be processed. The difficulty of the work is compounded by recurrent changes in the operating systems and constantly changing production procedures. The employee makes independent decisions about operating methods and techniques for test and developmental work and selects a course of action that provides for the most effective use of available computer resources, hardware, and/or software.

Factor 5, Scope and Effect -- Level 5-2 -- 75 Points

The work involves a wide range of operating problems and error conditions for the large-scale computer systems operating in multiprocessing/multiprograming modes with mixed batch and teleprocessing operational conditions. In resolving unusual conditions in the work environment, the employee develops new or revised operating procedures or methods for use by other operators where guidelines are lacking or nonexistent. The results of the work affect the accuracy, timeliness, and acceptability of computer operations for both special and recurring production workloads.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Personal contacts are with supervisor, support operators, technical coordinators, equipment specialists, operating system specialists, analysts, vendor customer engineers, and users of data processing services in related organizations, especially users of remote terminal stations. The contacts may be initiated by either party.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

The purpose of contacts is to plan, coordinate, or resolve unusual operating conditions and equipment problems; to develop procedures for testing and installing new or revised operating systems; to develop procedures for handling new processing requirements; to direct operational activities; and to expedite priority workloads.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work requires regular and recurring periods of walking, bending, and stooping; lifting and carrying reels of tape, disk packs, stacks of paper, and trays of cards weighing up to 30 pounds; and pushing tape carts weighing as much as 200 pounds up ramps leading to computer rooms.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work involves the common risks or discomforts, requiring normal safety precautions, typical of computer operations. The work is generally performed in computer operations areas with controlled air conditioning and relatively high noise levels. The employee is required to adhere to restrictive security regulations while in the computer complex.

TOTAL POINTS -- 1425

COMPUTER OPERATOR, GS-0332-08, BMK#: 1

Duties:

The employee maintains continuity of equipment operations and processing workflow; resolves equipment, program, and control problems ranging from common, recurring conditions to those that are complex and require time and attention away from the control console; sets up and tests new applications and systems programs and informs specialists about ways to use existing hardware and software capabilities in new programs more effectively and efficiently; and relieves console and other operators at their work stations in order to assure continuous workflow. This responsibility extends to operations in several systems performing multiprograming, batch, and teleprocessing operations. The employee normally has primary responsibility over either multiprocessor or multiprogram systems during a shift. Serves as senior operator on an assigned shift and sometimes serves as acting shift supervisor.

-- Directs and controls other operators in system start-up and restart procedures, taking control from the console or at individual equipment controllers when systems fail to respond to normal or standardized alternate procedures.

-- Reviews batch operating schedules in terms of known system problems and processing backlogs and adjusts batch memory allocations in balance with necessary teleprocessing requirements and need to provide for precedent processing.

  -- Adjusts batch job priorities and restructures internal queues to avoid program contentions, allow for precedent output, and provide for unscheduled jobs and user originated priority changes.

  -- Monitors work in progress by observing console messages and receiving status reports from console operators to assure that processing flow proceeds according to plan and looks for indications of equipment, memory, or CPU overload, degraded speeds, and other indicators that problem conditions are developing in the systems. Makes adjustments in memory allocations, and equipment assignments and other changes needed to ensure flow of high priority work and remove the potential for interference from lower priority jobs.

  -- Responds to console operator notifications of program and equipment problems that will not respond to established methods for correction through standardized console key-ins and takes over the console. Attempts to resolve equipment problems by working on the equipment itself (including control switches and panels, modems, and other interconnecting devices), identifying the nature of the problems, and seeking technical assistance from the supervisor, technicians, computer specialists or others.

  -- Analyzes equipment failures and workload requirements to rearrange processing schedules and equipment assignments within the limits of less than normal processing capacities. Directs the console operator as to which jobs to keep processing and the key-ins required to work with reduced capacity and personally attempts to resolve or have others resolve the equipment problems.

  -- Sets up test applications and system programs, activates internal utility routines to accept and process such programs, monitors their flow through the system, and initiates system dumps for use by specialists in improving program processing.

  -- Enters new tested programs into the systems and instructs console operators on new and/or special instructions for processing them.

Factor 1, Knowledge Required by the Position -- Level 1-5 -- 750 Points

Indepth knowledge of standard and nonstandard operating methods, techniques, and procedures and the console command languages to isolate, identify, and resolve or seek assistance in resolving problems that affect system operating efficiency. This especially involves conditions that cannot be corrected through normal operator controls or require time and effort away from the control console for which the console operator cannot be spared while work continues in progress. This knowledge is used also to diagnose the nature and sources of problems involving equipment, programs, or

systems and to define the results of such analysis to others who specialize in resolving such conditions.

Indepth knowledge of the structure and applications of internal control and utility programs to avoid or overcome error or problem situations involving unusual combinations of commands and utility program applications. This knowledge is used also to test new applications programs, analyze test results and suggest ways to better use established software capabilities, equipment assignments, standard and nonstandard system configurations, and other means for improving program operating efficiency and avoiding problems.

Knowledge of system job control languages to check job entry card decks, change/correct entries on specific cards or the sequence of the control cards, and to change controls such as device assignment or job steps for jobs in progress.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

Work assignments are made in the form of general instructions covering anticipated processing schedules, including program tests, known equipment problems, and modifications to standing operating procedures. The employee refers to the supervisor only unusual operating problems, such as those that will not respond to attempted corrective action, and recommends modifications in standing operating procedures to accommodate new job requirements or techniques to overcome problems in equipment or to clear teleprocessing access problems.

The employee performs the work independently, including work involving planning and implementing changes in processing schedules to avoid equipment or channel problems and notifying vendor representatives of the need for repairs. Finished work is reviewed on the basis of log and trouble reports and information from technical and subject-matter users about the quality and timeliness of their products. The methods used in arriving at work results are seldom reviewed in detail and often become the basis for new or revised standing operating procedures.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Written guidelines are available in the form of a variety of manuals, such as manufacturers' operating and problem-solving manuals for each kind of equipment, internally developed standing procedures, and similar references. In addition, the employee follows program run books and run sheets and operator log entries in performing the work. Verbal instructions or suggestions for doing the work are provided by the supervisor and others when the employee performs test or other special work assignments.

The guidelines cover recurring work and problem conditions in detail. However, for unusual errors or problems in the operating system programs, peripheral equipment, or teleprocessing channels and equipment, the employee is expected to deviate from, interpret, and adapt the guidelines to correct conditions that are not specifically covered. Similarly, when testing new programs the employee adapts guidelines for conventional operations to special and unusual processing requirements. The employee prepares written reports about the results of adaptations to correct equipment and channel failures or successful program testing and recommends changes in operator manuals.

Factor 4, Complexity -- Level 4-3 -- 150 Points

The employee performs a wide variety of standard and nonstandard operating tasks involving different methods and procedures, for example, to:

-- resolve operating problems that do not respond to normal override techniques and methods.

-- test new operating systems, programs, memory devices, or remote processing connections.

-- test new operating methods and techniques.

The employee decides what is to be done from studying error and problem conditions, reviewing objectives and devising operating techniques to accomplish processing for new programs, and analyzing the results of error corrections and program tests. The employee identifies or plans the sequence of variable and standard operating processing methods and procedures needed to prepare, process, or resolve the conditions involved.

Actions taken by the employee differ according to the kind of equipment involved, the nature of the problems encountered in ongoing or test jobs, whether the conditions involve batch or teleprocessing work, the impact of problems on other work processes, and other elements that must be analyzed to discern interrelationships and approaches to actions or solutions.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The work involves a wide range of conventional and unconventional operating and problem-solving conditions that are not always covered by established or standardized procedures. The employee treats such conditions in conformance with established criteria that set the framework for accomplishing problem solutions and implementing system and program changes which, although they are common to data processing work, are often lacking in description of the specific kinds of conditions encountered.

The results of the problem-solving and testing work affect the efficient operation and productivity of the computer system and contribute to the effective and efficient introduction of new and revised processing capacities available in the system.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Personal contacts are with computer and subject-matter specialists in the immediate and related organizations and with specialists in other organizations using remote access job entry and teleprocessing terminals. Some of the contacts occur regularly and others are established by the users as product questions and problem conditions require. The contacts may be initiated by either party and the role of each participant and the purpose of the contacts are readily established. Personal contacts are also made with equipment and software vendor representatives concerning system failures and scheduled maintenance.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

The purpose of many of the contacts is to plan, coordinate, or resolve problems and questions concerning such topics as unusual operating or equipment problems, procedures for testing or installing new system or program variations, or developing new operating procedures to accommodate such requirements.

The work is sedentary. Typically, the employee may sit comfortably to do the work although there may be some walking, standing, or carrying of light items, such as papers, books, or small parts. No special physical demands are required to perform the work.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work involves the common risks or discomforts, requiring normal safety precautions, typical of offices, meeting rooms, libraries, and the like. The work area is adequately lighted, heated, and ventilated. The computer room is an environmentally controlled area and, although relatively cool, requires only normal clothing to compensate for minor discomfort.

TOTAL POINTS -- 1685

COMPUTER OPERATOR, GS-0332-09, BMK#: 1

Duties:

The employee monitors the operations of several large-scale computer systems to identify problem conditions that will not respond to normal operator intervention methods, runs diagnostic software routines to determine the operating integrity of the system, realigns equipment interconnections, isolates and identifies the source and nature of system software problems, and acquires assistance from vendor representatives or systems programmers for significant equipment or software malfunctions. In addition, the employee participates with systems specialists in planning and implementing the introduction of major new applications programs, and additions or changes to equipment and operating system software.

The computer systems operate primarily in teleprocessing configurations involving data entry and retrieval operations, batch processing, and interactive data processing (job entry, inquiry, and program development).

  -- Directs and controls operators in system startup or restart procedures.

 o Insures that system hardware is configured according to specifications provided by software system designers.

 -- Monitors a specially designed system display terminal for messages indicating system status; takes over control of analysis and solution for problems that cannot be resolved by console operators.

 o Adjusts job priorities, reassigns equipment between systems, traces and resets controls for teleprocessing connections, locates applications and system software malfunctions and reports to systems specialists, and isolates and identifies hardware malfunctions and calls in vendor technicians for assistance.

 -- Monitors status of teleprocessing components by observing console displays or being notified of problems by terminal users.

 o Isolates faulty device and resets, repairs, or calls vendor for repairs; adjusts modem settings; restarts minicomputer control units; reassigns access channels to terminal users; resolves access for users with low priority requirements; and takes other similar actions pending system restoration.

 -- Orders system dumps and takes equipment status readings in case of system failures and identifies any unusual operating conditions at the time of failure.

  o Analyzes status information to identify the source of equipment failures as either directly in the hardware, in teleprocessing connections, applications programs or system software, or others that may be identified from the system reports.

  -- Participates with system specialists to plan and implement revised or new operating configurations (added teleprocessing capacity, increased or reduced mass memory capability, additions to a Data Base Management System, etc.) in order to introduce new, one time, or test processing requirements and/or to introduce new operating systems or revisions to existing operating systems.

  o Prepares detailed descriptions of new configuration and operating characteristics and supplements operator instructions to describe the application of such changes in daily operations.

Factor 1, Knowledge Required by the Position -- Level 1-6 -- 950 Points

Practical knowledge of a wide range of interrelated technical methods, principles, and practices of data processing equipment, systems analysis, and programming to analyze, diagnose, and resolve complex operating problems involving a variety of applications programs, systems software, and interlocking equipment systems.

Extensive knowledge of a wide range of analytical and diagnostic methods, procedures, and principles concerning equipment systems, storage media and devices, and interrelationships between host computer systems and remote access and teleprocessing terminals.

Knowledge of both standard and nonstandard equipment operating characteristics and alternative methods for controlling such equipment in making unusual interconnections and rarely used equipment and channel configurations to direct processing through or around problems in applications and operating systems, equipment, circuits, and/or channels. This knowledge is used also in working under the guidance of a systems specialist to plan, develop, and implement new or revised operating methods, techniques, and procedures for purposes such as: testing one of a kind, special purpose, or new processing requirements and activating and adjusting new operating systems or changes to existing systems.

This knowledge is used to make decisions and take actions, for example, to: order and interpret system dumps to identify the nature and source of problems; order and implement backup and recovery procedures; direct the continuation of important processing operations on degraded systems; reallocate equipment configurations to work around hardware or circuit malfunctions; and other actions requiring extensive knowledge of equipment, programs, and operating options. This level of knowledge is used in supporting several large scale multiprocessor and/or multiprograming computer systems operating in a variety of modes such as batch, demand, realtime, interactive, and

teleprocessing. The systems may be configured in many variations and combinations of: input/output channels and access methods, sequences of controllers and buffers (including minicomputer subsystems), and many connections to remote terminal processing stations.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

The supervisor assigns work in general instructions concerning processing objectives and priorities, unusual deadlines, known equipment problems, and modifications to standard operating procedures.

The employee performs the work independently including planning and implementing changes in processing schedules, coordinating with vendors and specialists concerning problems and new requirements, and resolving or working around operating problems. Only highly unusual operating problems are referred to the supervisor, such as those that will significantly delay operations or may cause a shutdown in operations. The employee recommends modifications in standard operating procedures to accommodate new job requirements and techniques to overcome problems in equipment or teleprocessing access and response problems.

Completed work is reviewed for continuity of operations and conformity to deadlines and accepted practices on the basis of end of shift reports, user reports, and log notes concerning problems encountered and resolved or left unresolved. Methods used in arriving at work results are seldom reviewed in detail except as they may become the basis for new or revised standard operating procedures.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Written guidelines are available for all systems in the form of a variety of vendor equipment manuals and internally developed supplements describing standard operating procedures. The guidelines cover recurring work and problems in detail. However, there are gaps in information and specificity for unusual errors and problems involving equipment and software systems and the employee deviates from established guidelines to interpret and adapt to conditions and situations that are not covered. The employee records the nature and resolution of highly unusual problems and recommends changes in operating procedures.

Factor 4, Complexity -- Level 4-4 -- 225 Points

The employee performs a wide variety of standard and nonstandard operating tasks using a variety of methods and procedures in work involving, for example:

  -- resolving highly unusual operating problems that do not respond to normal or previously tried techniques and methods;

-- testing new operating systems, programs, memory devices, or remote processing connections; and

-- testing new operating methods and techniques, and developing new or revised operating procedures.

The employee decides what is to be done from studying error and problem conditions, reviewing processing objectives and devising operating techniques to accomplish processing for new programs, and analyzing the results of error corrections and program tests. The employee identifies or plans the sequence of variable and standard operating processing methods and procedures needed to prepare, process, or resolve the conditions involved.

Actions taken by the employee differ according to such conditions as the kind of equipment involved, the nature of the problems encountered in ongoing or test jobs, whether the conditions involve batch or teleprocessing work, the impact on problems or other work processes, and other elements that must be identified and analyzed to discern interrelationships and approaches to actions or solutions.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The work involves monitoring and/or operating computer systems; devising means to maintain continuity of workflow through normal and degraded system conditions; resolving common and unusual operating problems; ensuring that telecommunications are operational for batch and interactive terminal sites; and working with specialists to develop appropriate operating procedures for new and revised processing and systems software requirements.

Work results affect the efficiency of operations, and quality of data processing products and services, and the adequacy of data used in subject matter processes.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Personal contacts are with subject-matter specialists in other organizations, contractor personnel using remote processing facilities, vendor hardware and software representatives, and data processing specialists in the immediate and related organizations. The contacts may be initiated by either party and the role of each participant and the purpose of the contacts are readily established.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

The purpose of many contacts is to plan, coordinate, or resolve problems and questions concerning such topics as unusual operating or equipment problems, procedures for testing or installing new

systems or program variations, or developing new operating procedures to accommodate such requirements.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work regularly involves extended periods of standing, walking, bending, stooping, and carrying heavy loads of paper, tapes, or cards weighing as much as 50 pounds.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work involves the common risks or discomforts typical of offices, meeting rooms, libraries, and the like, involving safety precautions normal to such settings. The work area is adequately lighted, heated, and ventilated. The computer room is relatively cool although it requires only normal clothing to compensate for minor discomfort.

TOTAL POINTS -- 1975

EXPLANATORY MEMORANDUM

This memorandum provides interpretive/explanatory information regarding the classification standard for the Computer Operation Series, GS-0332. The memorandum does not contain grade evaluation criteria.   Explanatory memoranda provide background information intended to help users in understanding and applying the standard and explaining its contents to employees and managers.

Introduction

The tentative standard for the Computer Operation Series was distributed in August 1981 for review, test application, and comment. Agencies committed considerable time and effort to studying and testing the draft standard and in developing their comments. The insights and analyses provided by the reviewers were extremely useful and the final standard incorporates many of the suggestions and recommendations that were offered.

The draft standard was generally well received, with the vast majority of reviewers indicating that most of their computer operators were covered by the tentative factor level descriptions and/or the benchmarks. The comments and recommendations for change received from reviewers, and the actions taken on them, are described in the following sections.

General

Some reviewers were concerned that the draft insufficiently linked operator responsibilities and grade levels with related work in the Computer Specialist Series, GS-0334, and the Computer Clerk and Assistant Series, GS-0335. Most of these comments were based on concern that the draft did not specifically describe GS-9 duties and responsibilities for computer operators as did the previous standard. As a result, changes were made in the final standard to describe the GS-9 operator level and help distinguish senior operators from computer assistants and specialists involved in similar kinds of problem-solving duties and responsibilities. These changes should assist agencies in identifying the approximate boundary between the highest level of operator responsibilities and those duties which require skills common to the computer specialist occupation. Some highly atypical operator positions may exceed the criteria in this standard; these positions should be reviewed for possible allocation to the Computer Specialist Series.

Comments were received on every section of the standard and involved a range of concerns, from purely editorial suggestions to those involving the substantive grade-determining contents of factor levels and the need for improved and additional benchmarks. The three major concerns, which are fully addressed in the final standard, were:

(1) Need for a glossary of data processing terminology.

(2) Need for criteria and a benchmark description covering GS-9 level work.

(3) Inadequacies in the GS-5 and GS-7 benchmarks.

SERIES DEFINITION

ISSUE: A suggestion was made to amend the Series Definition, adding identifiers for additional equipment that may be included in a computer system.

DISCUSSION: This suggestion was not adopted because computer hardware configurations vary immensely and it would be difficult to capture a "typical" configuration as a part of defining the operator series. Also, as technology evolves, computer nomenclature will continue to change and tend to make the series definition obsolete. However, such information was added in the sections discussing the nature of the equipment used and the nature of the work.

NATURE OF THE EQUIPMENT USED

ISSUE: This section needed some editing in order to provide a better definition of operating systems, multiprograming, and other terms of concern to operators in performing their duties. A number of reviewers suggested adding a glossary of terminology similar to those in the standards for Computer Specialist, GS-0334, and Computer Clerk and Assistant, GS-0335.

DISCUSSION: This section was revised and terminology such as operating systems, multiprograming, and multiprocessing were placed in a different, clearer context. Also, a glossary of data processing terminology was added, similar to those in the other two computer occupational standards, but keyed more specifically to operator responsibilities.

ISSUE: A few reviewers questioned the ability to set up training and career progression positions since the benchmarks describe full performance levels in grades that, in many organizations, are typically used for developmental positions.

DISCUSSION: Information was added to explain that, for training and development positions, the factor level descriptions should be applied and are intended for such purposes. Benchmarks for training level positions were purposely omitted from the standard since, depending on the nature and complexity of particular systems and the scope and depth of employee duties and responsibilities, trainee levels can occur at different grade levels (usually, GS-2 through GS-6). Training can also extend beyond those levels for employees preparing to perform duties beyond normal operations, such as significant problem-solving duties requiring some knowledge of systems and programming work.

FACTOR LEVEL DESCRIPTIONS

Knowledge Required by the Position (Factor 1)

ISSUE: Some reviewers suggested that knowledge levels 1-3 and 1-4 were too broadly stated and should be modified to fit more closely the intent of the primary standard and establish a better flow into the higher levels of knowledge.

DISCUSSION: Levels 1-3 and 1-4 were edited to present a more precise description of knowledges, skills, and abilities and the kinds of operating activities in which they are applied. With changes in (()) level 1-5 and the addition of level 1-6, the flow of the knowledge factor levels better captures the concepts and intent of the primary standard.

ISSUE: Factor level 1-5 was described by reviewers as exceeding the intent of that level and containing material that properly fits in level 1-6. Of particular concern was the material concerning unusual problem conditions and nonstandard equipment controls. Also, the level of work in supporting or assisting specialists was considered too demanding for this factor level.

DISCUSSION: Factor level description 1-5 was revised, incorporating suggestions for change and removing those elements that clearly exceeded the threshold for the 1-5 level. Some of the removed material was modified and incorporated into a new factor level 1-6.

ISSUES: For a number of different reasons, many reviewers recommended adding factor level 1-6 to the standard. These reasons included: legitimate parallels with problem-solving work described in the Computer Clerk and Assistant standard; the inclusion of some information in level 1-5 which more appropriately should be described at the 1-6 level; the need for recognizing the depth of independent problem identification and problem resolution duties that operators perform in many computer centers.

DISCUSSION: Additional factfinding was conducted to observe work situations where level 1-6 is applicable and to obtain information for describing such work processes. Based on this factfinding, and comments and analysis provided by reviewers of the draft, a description of factor level 1-6 was added to the standard.

Supervisory Controls (Factor 2)

ISSUE: A few reviewers suggested that the standard should contain level 2-4 for supervisory controls and submitted descriptions of work situations to support application of that level.

DISCUSSION: A review of the position descriptions and other written material submitted made it clear that some senior computer operators perform their work with a degree of independence that exceeds the threshold for level 2-3. However, in several important ways, such work does not satisfy the intent of the primary standard for crossing the next threshold and receiving credit for level 2-4. The supervisory controls factor contains three concepts describing (1) the way work is assigned, (2) employee responsibility for performing the work, and (3) the nature and purpose of reviews over the work. In order to identify the appropriate level for a position, all three concepts must be satisfied. Analysis conducted during this study indicates that the level of supervisory controls described in factor level 2-4 is characteristic of supervisors and chiefs of computer operations. Nonsupervisory operators perform work according to rather specific directions and when the work is reviewed it is for more specific purposes than are described in that factor level. Some employees are assigned responsibility for performing work that could justify assigning level 2-4 under the second concept (employee responsibility for doing the work). However, that satisfies only one of the concepts described and is insufficient for assigning the 2-4 level to typical operator positions. The study did not provide information to suggest that work in operator positions at the 2-4 level is either typical or common. Therefore, this level was not added to the final standard.

Guidelines (Factor 3)

ISSUE: A suggestion was made to provide a definition for the guidelines factor better tailored to the occupation, rather than using the general definition contained in the primary standard.

DISCUSSION: We agreed and the factor level description for guidelines was rewritten accordingly.

Complexity (Factor 4)

ISSUE: For many of the same reasons cited to support addition of level 1-6 for knowledge, several reviewers suggested that level 4-4 for complexity is properly applicable to some computer operator positions. In combination with factor level 1-6, level 4-4 would aid in supporting properly classified GS-9 positions, paralleling similar work situations and the factor level pattern contained in the Computer Clerk and Assistant standard.

DISCUSSION: This level was well supported by written analyses and additional onsite observation and was added to the final standard.

BENCHMARKS

ISSUE: Several reviewers expressed the opinion that full performance levels at GS-3/4 are not appropriate. These reviewers suggested that the complexity of computer operations is such that

employees at those grade levels cannot be expected to effectively perform the work independently. Full performance at these levels was not provided for in the previous standard.

DISCUSSION: Full performance level benchmarks at grades GS-3/4 were included because "minicomputers" requiring full time operator attendance were found in a number of locations during factfinding. We observed a growing tendency to establish such capability for highly specialized, limited purposes when this form of operations is more efficient than large scale systems in supporting subject-matter users. The number of such installations is sufficient to consider that the work is typical in the occupation, albeit still evolving. Typically, such systems are highly structured in the amount and kind of work they can process and limited in the variety of activities the operator can perform. Therefore, for such limited work on small computer systems or, for that matter, limited aspects of operating larger and more complex computers, the benchmarks reflect properly classified full performance level positions beginning at grade GS-3.

ISSUE: The GS-5 benchmark was viewed as overstated in scope and depth of functions and responsibilities and should be brought into better alignment with the factor level descriptions.

DISCUSSION: We agreed with the reviewers' analysis on this benchmark and replaced it with a slightly modified version of a benchmark proposed by one of the commenting agencies.

ISSUE: The GS-6 benchmark was depicted by reviewers as insufficient to illustrate computer operations work at this level. Several reviewers suggested that additional benchmarks for the GS-6 level should be added to the standard.

DISCUSSION: As explained in the introductory material in the standard, the variations in job content in this occupation are so diverse that any attempt to be comprehensive in benchmark coverage is impractical. Those benchmarks that are in the standard exemplify application of the factor levels in representative positions in each of the covered grade levels. The GS-6 benchmark was revised to better fit the progression of work from GS-5 to GS-7 and to clarify the limitations placed on operators of some very large computer systems that are typical at grade GS-6.

ISSUE: The GS-7 benchmark was described as inadequate by a number of reviewers who felt it reflected improper application of the factor levels, overstated responsibilities, and was inadequate as a base for progression to higher level positions. It was suggested that the benchmark be significantly revised or replaced.

DISCUSSION: After changes were made in some of the factor levels in the standard, this draft benchmark did not adequately reflect the application of factor level descriptions to a job situation. Rather than revise the benchmark, it was removed and replaced by another that was based on a position description submitted by one of the reviewing agencies.

ISSUE: The GS-8 benchmark was criticized because it contained references to "senior" operator, intermittent shift supervisor, or shift leader kinds of responsibilities which some reviewers found in conflict with the Work Leader and Supervisory Grade-Evaluation Guides. The benchmark was perceived to contain a mix of GS-8 and GS-9 level work and recommendations were offered to clarify both the leader/ supervisor and grade level aspects of the benchmark.

DISCUSSION: This benchmark was revised in line with the suggestions and recommendations made by reviewers. Although the draft intended to show that employees with significant problem-solving responsibilities are typically the senior operators on a shift and, therefore, often "in charge" of many shift activities, it was not intended to conflict with either the Work Leader or Supervisory Grade-Evaluation Guide. Positions meeting the definitions of supervisor or work leader should be classified according to the applicable guide. There are instances, however, in which a nonleader, nonsupervisory operator may have responsibility for meeting production requirements on an assigned shift. The standard presumes that such an employee also has responsibility for problem identification and problem resolution, at a level that will often merit grade distinction based on those technical responsibilities.

ISSUE: A benchmark at the GS-9 level was not included in the draft standard. A number of reviewers commented on that fact and provided information to demonstrate that GS-9 is a proper grade level for a number of positions in the occupation. A number of recommendations were made to add factor levels. Position descriptions were provided, and analyses of work situations were submitted to support criteria and a benchmark for GS-9 in the final standard.

DISCUSSION: Factfinding to develop the draft standard suggested that some work in the occupation equated to the GS-9 level and that criteria supporting that level might be developed. Some difficulty was encountered, however, in pinpointing such criteria and in making the distinction between GS-9 and GS-8. Since the factfinding did not produce a firm set of criteria and a benchmark for GS-9 typical of a number of work situations in the occupation, it was not included in the draft standard. In effect, the comment process was specifically relied on to provide enough additional information to determine whether or not GS-9 is a typical level in the occupation. Information contained in the comments was supplemented by additional onsite factfinding and the final standard includes factor levels 1-6 and 4-4 and a benchmark describing GS-9 level work in the occupation.